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(54) **Alarm apparatus and a method for monitoring the alarm apparatus**

(57) Alarm apparatus comprising siren alarm means 10, where said alarm means emits a sound signal in response to the application of an alarm and/or test signal. The signal generator 12 under the control of a microprocessor 14 generates a high frequency alarm signal which is applied to the siren 10 in response to an alarm condition being determined by the central control panel 16 of the security circuit 15. Low frequency test signals are applied periodically to the siren 10 by a signal generator 12, which cause the siren to emit a low volume sound signal for testing thereof. A microphone 30 adjacent the siren 10 detects the sound signals emitted. On the microphone failing to detect the sound signals emitted by the siren 10, the microprocessor 14 determines that a fault condition exists in the control box, and transmits an alert signal to the central control panel 16 of a security circuit 15, which in turn relays an alert signal to a central monitoring station over a telephone network.

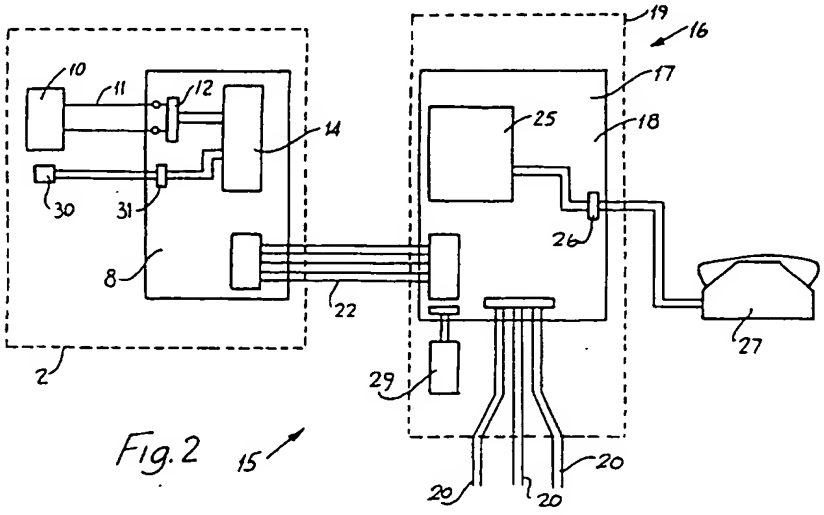

Fig. 2 15

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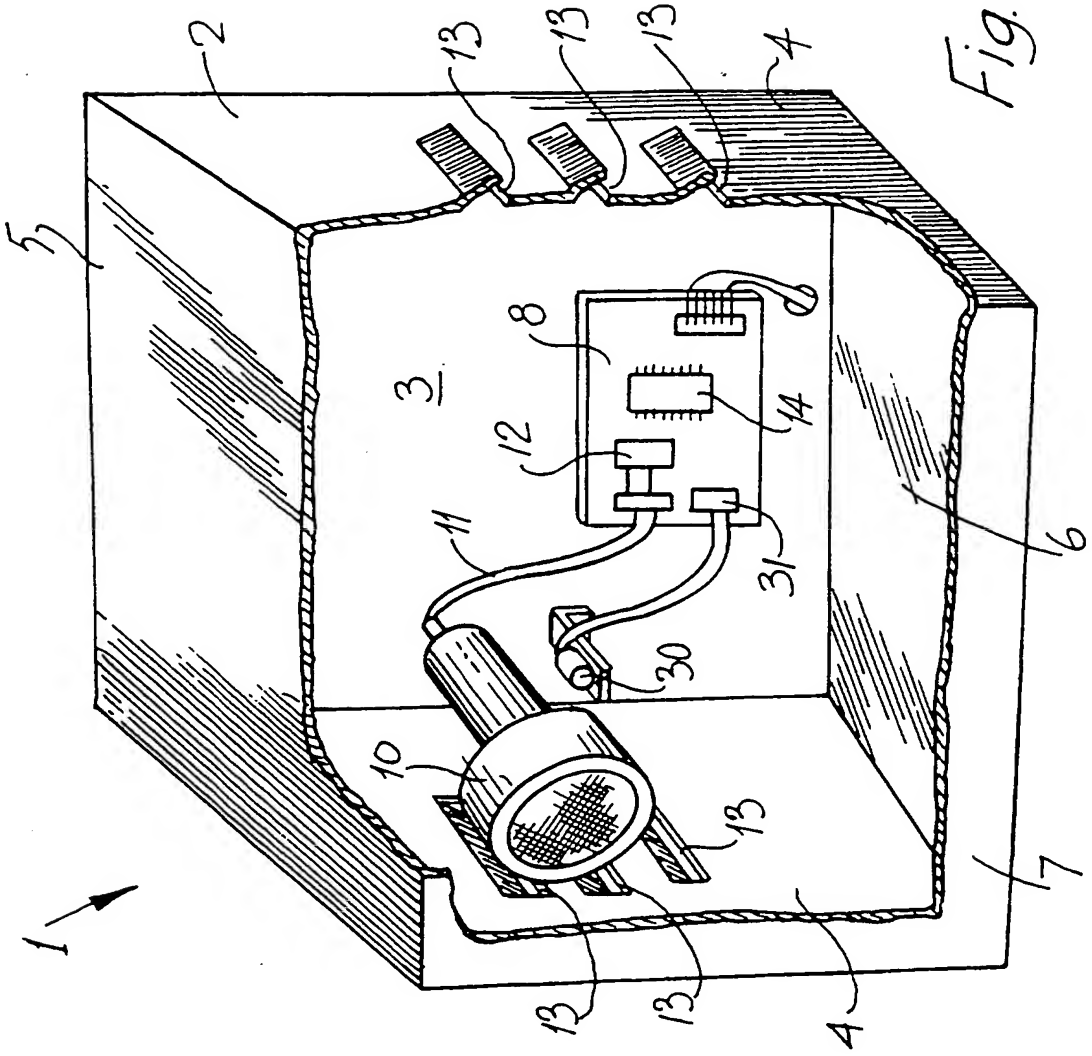

Fig. 1

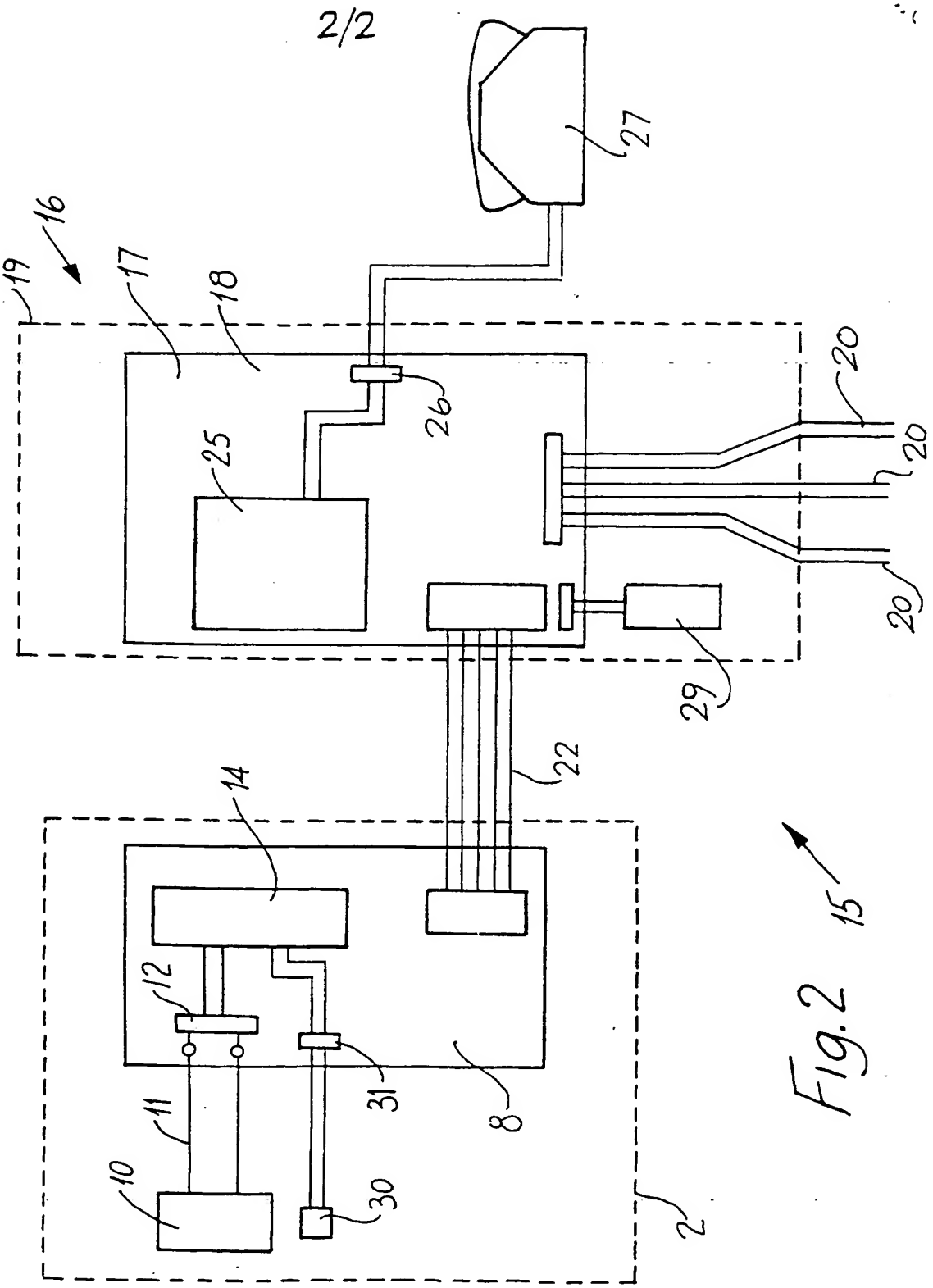

Fig. 2

"Alarm apparatus and a method
for monitoring the alarm apparatus"

The present invention relates to alarm apparatus, and in particular, to alarm apparatus for use with a security circuit, and typically, to an alarm apparatus, such as the type which is normally contained in an alarm box for mounting on an exterior wall of a house, building or the like, and the invention also relates to a method for monitoring the alarm apparatus, and to a security circuit which comprises the alarm apparatus.

Alarm apparatus for mounting on an exterior wall of a house or building, generally referred to as an alarm box is well known. In general, the alarm box is of steel or plastics material. A siren for attracting the attention of passers-by is mounted in the alarm box, and the siren, in general, is activated by a signal from a central control panel of a security circuit. Such signals, in general, are outputted by the control panel of the security circuit on an alarm condition being detected within the house or building. In general, the siren is of the type which comprises a piezo electric crystal. A high frequency signal is delivered to the siren which causes the piezo electric crystal to resonate, thereby generating a siren type sound. The high frequency signal may be delivered to

the siren directly from the control panel of the security circuit, or it may be delivered to the siren from a signal generator located in the alarm box. In which case, the signal generator within the alarm box is activated by a signal from the control panel. However, irrespective of the source of the high frequency signal, the frequency of the signal is generally matched to the natural frequency of the piezo electric crystal, thereby causing the piezo electric crystal to resonate at its natural frequency.

A problem with such alarm boxes is that the siren can be interfered with relatively easily by injecting a material into the alarm box which either solidifies around the siren, or encases the siren thereby preventing sound issuing from the siren. Typically, expanded plastics material are used for interfering with a siren. Such plastics material may be stored under pressurised conditions in a liquified form in an aerosol can, and when injected into the alarm box, the plastics material foams and solidifies. In general, air vents are provided in the alarm box for ventilating the alarm box and also for allowing the sound emitted by the siren to exit from the box. Even in cases where air vents are not provided, in general, a cable accommodating opening is provided into the alarm box, and the plastics material can be injected through the

cable opening. Even where an alarm box is completely sealed, a small hole drilled in the box is sufficient for enabling a sufficient quantity of the plastics material to be injected into the box for encasing the siren.

Various mechanical detecting devices have been provided for mounting within the alarm box for detecting the injection of such plastics and other materials into the box. Such detecting devices relay a signal to the central control panel of the security circuit, in response to detecting tampering with the alarm box. However, in general, such mechanical detecting devices are of limited value, and in general, the plastics material foams so rapidly that it is frequently impossible to relay a signal from the mechanical detecting device to the central control panel of the security circuit before damage is caused within the alarm box which prevents a signal from the detecting device being relayed to the central control panel. A further problem with such mechanical detecting devices is that they do not always detect the presence of the plastics material.

There is therefore a need for an alarm apparatus for use in a security circuit which overcomes these problems.

The present invention is directed towards providing such an alarm apparatus, a method for monitoring the alarm apparatus and a security circuit comprising the alarm apparatus.

According to the invention there is provided an alarm apparatus for use in a security circuity, the alarm apparatus comprising an alarm means for emitting a sound signal in response to a test signal being applied thereto, a detecting means located in a position relative to the alarm means for detecting the sound signal emitted by the alarm means in response to the test signal, and a control means for transmitting an alert signal for alerting to failure of the alarm means, the control means being responsive to the detecting means failing to detect the sound signal from the alarm means in response to the test signal.

In one embodiment of the invention a signal generating means is provided for generating the test signal to be applied to the alarm means for activating the alarm means to emit the sound signal.

Preferably, the test signal is such as to cause the alarm means to emit the sound signal at a relatively low volume.

Advantageously, the test signal is applied to the alarm means for a predetermined period of time just sufficient for the sound signal emitted by the alarm means in response to the test signal to be detected by the detecting means. Preferably, the test signal is applied to the alarm means for a predetermined period of time of the order of approximately 100 milliseconds.

Advantageously, a plurality of test signals are applied to the alarm means at respective predetermined time intervals. Preferably, the test signals are applied to the alarm means at the respective predetermined time intervals of approximately one minute.

In another embodiment of the invention each test signal is applied to the alarm means under the control of the control means, and the control means monitors the detecting means as each test signal is being delivered to the alarm means for detecting a signal from the detecting means in response to the alarm means emitting a sound signal, and in the absence of a signal from the detecting means, the control means transmits the alert signal.

In a further embodiment of the invention the control means issues the alert signal in response to the detecting means having failed to detect the sound

signals from the alarm means in response to a predetermined number of consecutive test signals. Preferably, the control means transmits an alert signal in response to the detecting means having failed to detect the sound signals from the alarm means in response to three consecutive test signals.

In another embodiment of the invention the alert signal is transmitted by the control means to a central control panel of the security circuit.

In a further embodiment of the invention the central control panel is responsive to the alert signal for outputting the alert signal on a telephone line for relaying the alert signal to a central monitoring station.

In one aspect of the invention the detecting means comprises a sound detecting means, and preferably, a microphone. Ideally, the microphone is a relatively sensitive microphone. Advantageously, the microphone is mounted adjacent the alarm means for detecting the sound signals emitted therefrom.

In one embodiment of the invention the control means comprises an electrical circuit which comprises a microprocessor. Preferably, the electrical circuit and

microprocessor are mounted on a printed circuit board.

In one embodiment of the invention the alarm means is responsive to an alarm signal from the security circuit for emitting an audible alarm for indicating an alarm condition in the security circuit. Advantageously, the signal generating means is responsive to an alarm condition existing in the security circuit for generating an alarm signal to be applied to the alarm means.

In one embodiment of the invention the alarm means comprises a siren of the type comprising a piezo electric crystal for emitting the sound signal in response to the test signal. Preferably, the test signal is of frequency different to the natural frequency of the piezo electric crystal. Advantageously, the frequency of the test signal is less than the natural frequency of the piezo electric crystal. Ideally, the frequency of the test signal is such as to cause the piezo electric crystal to vibrate at a frequency which emits a barely audible sound signal, but which is of sufficient volume to be detected by the detecting means.

In one embodiment of the invention the piezo electric crystal is responsive to an alarm signal, the frequency

of which corresponds substantially to the natural frequency of the piezo electric crystal for emitting an alarm sound signal in response to an alarm condition existing in the security circuit.

In another embodiment of the invention the apparatus comprises a box, the alarm means, the detecting means and the control means being located in the box.

Additionally the invention provides a method for monitoring an alarm apparatus of the type for use in a security circuit, whereby the alarm apparatus comprises an alarm means for emitting a sound signal in response to a signal applied thereto, the method comprising the steps of applying a test signal to the alarm means, and monitoring the alarm means for detecting a sound signal emitted therefrom in response to the test signal, and in the absence of the sound signal from the alarm means in response to the test signal, transmitting an alert signal for alerting to the failure of the alarm means.

Preferably, the test signal is such as to cause the alarm means to emit the sound signal at a relatively low volume.

In one embodiment of the invention the test signal is applied to the alarm means for a predetermined period

of time which is just sufficient for the sound signal emitted by the alarm means to be detected. Preferably, the test signal is applied to the alarm means for a predetermined period of time of the order of approximately 100 milliseconds.

In another embodiment of the invention a plurality of the test signals are applied to the alarm means at respective predetermined time intervals. Preferably, the test signals are applied to the alarm means at respective predetermined time intervals of approximately one minute.

In another embodiment of the invention a detecting means monitors the alarm means, and an output from the detecting means is monitored for determining the presence or absence of a signal on the output in response to each of the sound signals from the alarm means. Preferably, the alert signal is transmitted in response to the detecting means having failed to detect the sound signals from the alarm means in response to a predetermined number of consecutive test signals.

In another embodiment of the invention the alert signal is transmitted in response to the detecting means having failed to detect the sound signals from the alarm means in response to three consecutive test

signals.

Ideally, the alarm means is monitored each time a test signal is applied to the alarm means.

In another embodiment of the invention the method further comprises the step of applying an alarm signal to the alarm means for causing the alarm means emit an audible alarm sound signal in response to an alarm condition existing in the security circuit. Preferably, the alarm means comprises a piezo electric crystal and the test signal is of frequency different to the natural frequency of the piezo electric crystal, and the alarm signal is of frequency similar to the natural frequency of the piezo electric crystal.

Preferably, the test signal is of frequency less than the natural frequency of the piezo electric crystal for causing the piezo electric crystal to emit the sound signal of barely audible sound, but of sufficient volume to be detected by the detecting means.

Additionally the invention provides a security circuit comprising the alarm apparatus according to the invention.

In one embodiment of the invention the security circuit

comprises a control panel, the control panel comprising a means for transmitting an alert signal in response to the alarm means failing to emit the sound signal in response to the test signal. Preferably, the control circuit comprises a means for outputting the alert signal onto a telephone line.

The invention will be more clearly understood from the following description of a preferred embodiment thereof which is given by way of example only, with reference to the accompanying drawings, in which:

Fig. 1 is a perspective view of alarm apparatus according to the invention, and

Fig. 2 is a block representation of a circuit diagram of a security circuit according to the invention comprising the alarm apparatus of Fig. 1.

Referring to the drawings and initially to Fig. 1 there is illustrated an alarm apparatus according to the invention indicated generally by the reference numeral 1 of the type for mounting on the exterior wall of a house or building for emitting an audible alarm sound for alerting passers-by to an alarm condition in the house or building. Typically, such alarm apparatus are

referred to as alarm boxes, and for convenience the alarm apparatus 1 will be referred to hereinafter as the alarm box 1. The alarm box 1 comprises a box like housing 2, which comprises a rear wall 3, side walls 4 joined by top and bottom walls 5 and 6 extending from the rear wall 3. A front wall 7 closes the housing 2. In general, the housing 2 is of sheet metal material and is normally be mounted by securing the rear wall 3 to an exterior wall of the house or building.

The alarm box 1 comprises a control means, which in this case comprises a control circuit which is provided on a printed circuit board 8 which is mounted in the housing 2 on the rear wall 3. An alarm means, in this embodiment of the invention a siren 10 of the type which comprises a piezo electric crystal (not shown) is mounted in the housing 2, and under the control of the printed circuit board 8 emits an audible alarm sound. Cables 11 connect the siren 10 to the printed circuit board 8. A signal generator 12 mounted on the printed circuit board generates a high frequency alarm signal which is applied to the siren 10 for causing the siren 10 to emit the audible alarm sound. A microprocessor 14 on the printed circuit board 8 controls the frequency of the signals generated by the signal generator 12 which are applied to the siren 10. In order to generate the audible alarm sound in the event

of an alarm condition occurring in a security circuit 15, see Fig. 2 into which the alarm box 1 is connected, the high frequency alarm signal generated by the signal generator 12 which is applied to the siren 10 is of a frequency which is matched to the natural frequency of the piezo electric crystal (not shown) in the siren 10 so that the piezo electric crystal (not shown) resonates, thereby emitting the audible alarm sound. Air vents 13 in the side walls 4 allow the audible alarm sounds from the siren 10 to exit the housing 2.

Before describing further aspects of the alarm box 1, the security circuit 15 will now be described with reference to Fig. 2. The security circuit 15 comprises a central control panel 16 which comprises a main control circuit 17 on a printed circuit board 18 which is located in a housing (not shown), but illustrated in broken lines 19 in Fig. 2. A plurality of circuits 20 which connect various security sensors (not shown) to the central control panel 16 are connected to the printed circuit board 18. Such security sensors may be inertia switches, infrared detectors, tamper switches mounted in security sensors and the like, for monitoring the windows, doors, areas and the like of the house or building. Cables 22 extending between the central control panel 16 and the alarm box 1 carry signals from the central control panel 16 for

activating the siren 10 in the alarm box 1 in the event of an alarm condition being detected by the central control panel 16.

A microprocessor 25 mounted on the printed circuit board 18 of the central control panel 16 controls the operation of the central control panel 16. A digital to analog converter 26 mounted on the printed circuit board 18 converts a signal from the microprocessor 25 for delivery to a telephone 27 which enables the microprocessor 25 to dial a central monitoring station in the event of an alarm condition being detected by the central control panel 16, and to output an alarm signal, typically a message to the central monitoring station on the telephone line to which the telephone is connected for summoning help of the appropriate type to deal with the alarm condition. A siren 29 is also mounted in the central control panel 16 for activation by the main control circuit 17 in the event of an alarm condition being detected by the central control panel 16.

The cables 22 are connected to the printed circuit board 8 of the alarm box 1 and the printed circuit board 18 of the central control panel 16, and as discussed above on an alarm condition being detected by the central control panel 16 a signal is relayed by the

microprocessor 25 through the cable 22 to the printed circuit board 8, and in turn, to the microprocessor 14, for in turn, activating the siren 10.

Returning now to the alarm box 1, the microprocessor 14 is programmed to cause the signal generator 12 to periodically issue low frequency test signals to the siren 10 which are of frequency lower than the natural frequency of vibration of the piezo electric crystal (not shown) of the siren 10, for testing the siren 10. However, the frequency of the low frequency test signals is such that each test signal causes the piezo electric crystal (not shown) in the siren 10 to vibrate to emit a low volume barely audible sound signal.

A detecting means, namely, a relatively sensitive microphone 30 is mounted in the alarm box 1 relatively close to the siren 10 for detecting the sound signals emitted by the siren 10 in response to the test signals. The microphone 30 is located sufficiently close to the siren 10 to detect the low volume audible signal, but sufficiently far away so that if a foamable plastics material is injected in liquid form into the housing 2 through the air vents 13, the thickness of the foamed plastics material between the siren 10 and the microphone 30 will be such as to be prevent the low volume sound signal from the siren 10 being detected by

the microphone. An analog to digital converter 31 mounted on the printed circuit board 8 converts an analog signal from the microphone 32 to a digital signal, which is in turn, relayed to the microprocessor 14. The microprocessor 14 is programmed to monitor the microphone 30 on each test signal having been transmitted to the siren 10. On the microprocessor 14 determining that the microphone 30 has detected sound signal emitted by the siren in response to each test signal, the microprocessor 14 takes no action. However, on the microprocessor 14 determining that the microphone 30 has failed to detect the sound signals emitted by the siren 10 in response to three consecutive test signals, the microprocessor 14 generates an alert signal which is relayed through the cables 22 to the microprocessor 25, which in turn, generates an alert signal.

The alert signal generated by the microprocessor 25 firstly, activates the siren 29 in the central control panel 16, and secondly, dials the number of a monitoring station. The alert signal is then placed on the telephone line and relayed to the monitoring station over a telephone network. The alert signal may be an electronic signal which is identifiable by the monitoring station, or alternatively, may be a spoken message transmitted over the telephone network

indicating that the siren 10 in the alarm box 1 has failed. Such failure may be as a result of a technical fault in the siren or in the signal generator 12, or may be as a result of tampering with the alarm box, for example, by injecting a plastics material which foams within the alarm box 1 to encase the siren 10, thereby effectively silencing the siren 10.

In this embodiment of the invention a plurality of test signals are applied by the signal generator 12 to the siren 10 at predetermined time intervals of approximately one minute. Each test signal is applied to the siren 10 for a predetermined period of time, generally, less than one second, and typically, for example, 100 milliseconds. This is sufficient for causing the siren 10 to emit a low volume audible sound signal which can be detected by the microphone 30.

In use, for so long as an alarm condition does not exist in the security circuit 15, the microprocessor 14 controls the signal generator 12 to generate low frequency test signals at approximately one minute intervals which are applied to the siren 10. The microprocessor 14 monitors signals from the microphone 30 each time a test signal is applied to the siren 10 for a signal from the microphone 30 indicating that the low volume sound signal emitted by the siren 10 has

been detected by the microphone 30. For so long as the microprocessor 14 determines that the low level sounds emitted by the siren 10 are being detected by the microphone 30 no action is taken. On the microprocessor 14 determining that the microphone 30 has failed to detect sound signals emitted by the siren 10 in response to three consecutive test signals being applied to the siren 10, the microprocessor 14 generates an alert signal. The alert signal is relayed by the microprocessor 14 through the cables 22 to the microprocessor 25 of the control panel 16. The control panel 16 generates an alert signal which activates the siren 29 in the control panel, and dial the number of a monitoring station through the telephone line of the telephone 27, and issues an alert signal over the telephone network to the monitoring station. The monitoring station then takes appropriate action. Needless to say should there be an occupant in the house or building at the time, on hearing the siren 29 in the central control panel 16, the occupant may take appropriate corrective action.

The advantages of the invention are many. By virtue of the fact that the siren is monitored by a microphone, any failure in the alarm box irrespective of its cause is detected. For example, on a liquid plastics material being injected into the housing, and foaming

within the housing, should the foamed plastics encase the siren, and indeed the microphone, the microphone fails to detect the low level audible sound signal emitted by the siren in response to the test signal, and the absence of detection of the sound signal is then readily determined by the microprocessor. Likewise, should the siren fail for other reasons, this is also determined by the microprocessor on detecting the failure of the microphone to detect the sound signal from the siren. A further advantage of the invention is that a failure in the signal generator is also detected, since on such a failure, the siren fails to emit any sound, and this likewise is determined by the microprocessor in the control circuit of the alarm box. A further advantage of the invention is that by applying a test signal which causes the siren to emit a low volume sound signal, in general, the sound signal emitted by the siren is not perceptible to the public.

While the detecting means has been described as being a microphone, any other suitable detecting means may be provided. Any other suitable sound detecting means may be provided, and indeed, other suitable detecting means, such as, for example, a vibration sensing device may be provided for detecting the sound signal. In general, if the detecting means is provided by a vibration sensing device, it is envisaged that the

vibration sensing device would be mounted on or adjacent the alarm means for detecting vibration of the alarm means as a result of the sound signal being emitted by the alarm means. It will of course be appreciated that in all cases the detecting means will be provided in a form, and/or located relative to the alarm means so that in the event of the alarm means being damaged, or a foamable plastics or other material being delivered into a box or other container in which the alarm means and the detecting means are located the detecting means will fail to detect the sound signal.

It will of course be appreciated that while it is desirable, it is not essential that the alarm means be a siren. The alarm means may be any suitable alarm means, such as, for example, a bell, in which case, a single pulse test signal could be generated and applied to the bell for causing it to emit one tinkle which would be heard by the microphone or other suitable detecting means. Indeed, the test signal could alternatively be a relatively low voltage pulse signal so that the tinkle emitted by the bell would be barely audible.

While the test signal for testing the siren has been described as being of a frequency lower than the natural frequency of vibration of the piezo electric

crystal, it will of course be appreciated that the test signal may be of a frequency higher than the natural frequency of vibration. Once the test signal is not of a frequency similar to the natural frequency of vibration of the piezo electric crystal, the piezo electric crystal vibrates to generate a low level barely audible sound.

CLAIMS

1. An alarm apparatus for use in a security circuity, the alarm apparatus comprising an alarm means for emitting a sound signal in response to a test signal being applied thereto, a detecting means located in a position relative to the alarm means for detecting the sound signal emitted by the alarm means in response to the test signal, and a control means for transmitting an alert signal for alerting to failure of the alarm means, the control means being responsive to the detecting means failing to detect the sound signal from the alarm means in response to the test signal.

2. An alarm apparatus as claimed in Claim 1 in which a signal generating means is provided for generating the test signal to be applied to the alarm means for activating the alarm means to emit the sound signal.

3. An alarm apparatus as claimed in Claim 1 or 2 in which the test signal is such as to cause the alarm means to emit the sound signal at a relatively low volume.

4. An alarm apparatus as claimed in any preceding claim in which the test signal is applied to the alarm means for a predetermined period of time just sufficient for the sound signal emitted by the alarm

means in response to the test signal to be detected by the detecting means.

5. An alarm apparatus as claimed in Claim 4 in which the test signal is applied to the alarm means for a predetermined period of time of the order of approximately 100 milliseconds.

6. An alarm apparatus as claimed in any preceding claim in which a plurality of the test signals are applied to the alarm means at respective predetermined time intervals.

7. An alarm apparatus as claimed in Claim 6 in which the test signals are applied to the alarm means at the respective predetermined time intervals of approximately one minute.

8. An alarm apparatus as claimed in any preceding claim in which each test signal is applied to the alarm means under the control of the control means, and the control means monitors the detecting means as each test signal is being delivered to the alarm means for detecting a signal from the detecting means in response to the alarm means emitting a sound signal, and in the absence of a signal from the detecting means, the control means transmits the alert signal.

9. An alarm apparatus as claimed in any preceding claim in which the control means issues the alert signal in response to the detecting means having failed to detect the sound signals from the alarm means in response to a predetermined number of consecutive test signals.

10. An alarm apparatus as claimed in Claim 9 in which the control means transmits an alert signal in response to the detecting means having failed to detect the sound signals from the alarm means in response to three consecutive test signals.

11. An alarm apparatus as claimed in any preceding claim in which the alert signal is transmitted by the control means to a central control panel of the security circuit.

12. An alarm apparatus as claimed in Claim 11 in which the central control panel is responsive to the alert signal for outputting the alert signal on a telephone line for relaying the alert signal to a central monitoring station.

13. An alarm apparatus as claimed in any preceding claim in which the detecting means is a sound detecting means.

14. An alarm apparatus as claimed in any preceding claim in which the detecting means comprises a microphone.

15. An alarm apparatus as claimed in Claim 14 in which the microphone is a relatively sensitive microphone.

16. An alarm apparatus as claimed in any preceding claim in which the detecting means is mounted adjacent the alarm means for detecting the sound signals emitted therefrom.

17. An alarm apparatus as claimed in any preceding claim in which the control means comprises an electrical circuit which comprises a microprocessor.

18. An alarm apparatus as claimed in Claim 17 in which the electrical circuit and microprocessor are mounted on a printed circuit board.

19. An alarm apparatus as claimed in any preceding claim in which the alarm means is responsive to an alarm signal from the security circuit for emitting an audible alarm for indicating an alarm condition in the security circuit.

20. An alarm apparatus as claimed in Claim 19 when

dependent on Claim 2 in which the signal generating means is responsive to an alarm condition existing in the security circuit for generating an alarm signal to be applied to the alarm means.

21. An alarm apparatus as claimed in any preceding claim in which the alarm means comprises a siren of the type comprising a piezo electric crystal for emitting the sound signal in response to the test signal.

22. An alarm apparatus as claimed in Claim 21 in which the test signal is of frequency different to the natural frequency of the piezo electric crystal.

23. An alarm apparatus as claimed in Claim 22 in which the frequency of the test signal is less than the natural frequency of the piezo electric crystal.

24. An alarm apparatus as claimed in any of Claims 21 to 23 in which the frequency of the test signal is such as to cause the piezo electric crystal to vibrate at a frequency which emits a barely audible sound signal, but which is of sufficient volume to be detected by the detecting means.

25. An alarm apparatus as claimed in any of Claims 21 to 24 in which the piezo electric crystal is responsive

to an alarm signal, the frequency of which corresponds substantially to the natural frequency of the piezo electric crystal for emitting an alarm sound signal in response to an alarm condition existing in the security circuit.

26. An alarm apparatus as claimed in any preceding claim in which the apparatus comprises a box, the alarm means, the detecting means and the control means being located in the box.

27. An alarm apparatus substantially as described herein with reference to an as illustrated in the accompanying drawings.

28. A method for monitoring an alarm apparatus of the type for use in a security circuit, whereby the alarm apparatus comprises an alarm means for emitting a sound signal in response to a signal applied thereto, the method comprising the steps of applying a test signal to the alarm means, and monitoring the alarm means for detecting a sound signal emitted therefrom in response to the test signal, and in the absence of the sound signal from the alarm means in response to the test signal, transmitting an alert signal for alerting to the failure of the alarm means.

29. A method as claimed in Claim 28 in which the test signal is such as to cause the alarm means to emit the sound signal at a relatively low volume.

30. A method as claimed in Claim 28 or 29 in which the test signal is applied to the alarm means for a predetermined period of time which is just sufficient for the sound signal emitted by the alarm means to be detected.

31. A method as claimed in any of Claims 28 to 30 in which the test signal is applied to the alarm means for a predetermined period of time of the order of approximately 100 milliseconds.

32. A method as claimed in any of Claims 28 to 31 in which a plurality of the test signals are applied to the alarm means at respective predetermined time intervals.

33. A method as claimed in Claim 32 in which the test signals are applied to the alarm means at respective predetermined time intervals of approximately one minute.

34. A method as claimed in any of Claims 28 to 33 in which a detecting means monitors the alarm means, and

an output from the detecting means is monitored for determining the presence or absence of a signal on the output in response to each of the sound signals from the alarm means.

35. A method as claimed in Claim 34 in which the alert signal is transmitted in response to the detecting means having failed to detect the sound signals from the alarm means in response to a predetermined number of consecutive test signals.

36. A method as claimed in Claim 35 in which the alert signal is transmitted in response to the detecting means having failed to detect the sound signals from the alarm means in response to three consecutive test signals.

37. A method as claimed in any of Claims 28 to 36 in which the alarm means is monitored each time a test signal is applied to the alarm means.

38. A method as claimed in any of Claims 28 to 37 in which the method further comprises the step of applying an alarm signal to the alarm means for causing the alarm means emit an audible alarm sound signal in response to an alarm condition existing in the security circuit.

39. A method as claimed in any of Claims 28 to 38 in which the alarm means comprises a piezo electric crystal and the test signal is of frequency different to the natural frequency of the piezo electric crystal, and the alarm signal is of frequency similar to the natural frequency of the piezo electric crystal.

40. A method as claimed in Claim 39 in which the test signal is of frequency less than the natural frequency of the piezo electric crystal for causing the piezo electric crystal to emit the sound signal of barely audible sound, but of sufficient volume to be detected by the detecting means.

41. A method for monitoring an alarm apparatus of the type for use in a security circuit, the method being substantially described herein with reference to and as illustrated in the accompanying drawings.

42. A security circuit comprising the alarm apparatus as claimed in any of Claims 1 to 26.

43. A security circuit as claimed in Claim 42 in which the security circuit comprises a control panel, the control panel comprising a means for transmitting an alert signal in response to the alarm means failing to emit the sound signal in response to the test signal.

44. A security circuit as claimed in Claim 42 or 43 in which the control circuit comprises a means for outputting the alert signal onto a telephone line.

45. A security circuit substantially as described herein with reference to and as illustrated in the accompanying drawings.

The Patent Office

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Application No:	GB 9623442.2	**Examiner:**	Anita Keogh
Claims searched:	1-45	**Date of search:**	31 January 1997

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G4N (NAT1, NATX)

Int Cl (Ed.6): G08B (29/10, 29/12)

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2249207 A	(AUTOMATED SECURITY)	1 at least
X	GB 2197740 A	(TANNOY LTD)	1, 38 at least
X	EP 0716403 A1	(NIPPON)	1, 38 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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